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November 25, 1952

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Dear Bill:

Enclosed is a re-write on the specifications covering the small power plant. I think it is amazing that the prototype unit came out so close to the original specifications that I released last year.

With this prototype, we certainly have and are proving our point as to the effectiveness of a 4 cycle sleeve engine as well as the excellent efficiency and control of the alternator. We admit it may not be packaged to meet the various requirements of different agencies but the dirty and hard work is now accomplished.

The reason for writing you at this time is that B/G, USAF Retired, who is in on this project, will be in Washington within the next week. I have asked him to contact you as I am most anxious to have you both meet. Russ in his past official capacities has been extremely cooperative with CIA and is acquainted with many of your problems and objectives.

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Kindest personal regards.

Cordially yours,

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President

WVS:md
Encl.

MINIATURE POWER PLANTS

Attached are specifications covering a miniature power plant consisting of a gasoline engine and an alternator or generator. Both the engine and alternator are revolutionary in design and a tremendous advancement in efficiency. While the requirements for such equipment vary in power capacity from 50 watts up to 1500 watts in the small sizes, we arbitrarily chose a unit that would have a nominal capacity of 300 watts output. A survey of known existing equipment of this type indicates that we have met all requirements. The engine is quick starting, low weight per horse power and practically free from required maintenance as it only has nine moving parts.

The alternator is designed around a novel load sensitive principle which offers a mechanical displacement coupled to the gas injection system for speed control, offering absolute voltage output regulation. By using special lamination material, the highest possible electrical efficiency is realized so that the weight is very low. There are only two moving parts and no slip rings or brushes. Outside of periodic lubrication, no maintenance of any sort is required.

Our survey of the power plant field indicates that existing units in use or proposed have not proved very dependable because of the engine. The two cycle models are difficult to start and are somewhat critical. The four cycle models have better starting characteristics but are relatively short lived along with low efficiency at the high speeds required. Our approach has been to develop a dependable engine which is easy starting with a long life and high efficiency. This indicates a four cycle design. However, above 6000 RPM poppet valves do not respond well to control because of their mass and the high acceleration encountered. We have surmounted this by the use of a single sleeve valve which in three planes of motion accomplishes all of the desired functions. To match the alternator we have set the operating speed in the range of between 6000 and 8000 RPM, which coincides with the highest efficiency of the engine. Our first operating model may be physically larger than need be as it is very conservatively constructed. The elements creating this size are in the cooling fins and packaging. An inspection indicates that this size and weight may be materially reduced if required. Operating under load, the engine at normal temperatures is only warm to touch.

The alternator consists of a rotating lamination member incorporating the blower system and the electro-magnetic assembly is mounted within this structure. As the electrical load on the alternator is increased or decreased, the electro-magnetic assembly is angularly displaced which motion can be coupled to the fuel injection system of the engine for speed control. The response is immediate and can be damped to accomodate any operating characteristics desired.

To appreciate the efficiency of our operating prototype, we are realizing a 300 watt output with an engine power of .56 horse power.

We have made two 50 hour runs on this equipment without experiencing any sign of fatigue or wear or incorrect design and approach. We can see no reason why a 2000 hour life cannot be easily accomplished.

Such equipment has a multitude of uses for field Teletype, radio sets, radio sonde, radio weather beams, illumination, airborne electronic equipment, parachute-dropped equipment and for other portable and portable mobile applications.

The following detailed specifications cover our operating prototype power plant:

SPECIFICATIONS - ENGINE

1. Single cylinder engine
2. Air cooled
3. 4-cycle
4. Single sleeve valve
5. Bore - 1.25 inch diameter
6. Stroke - 1.00 inch
7. Displacement - 1.227 cubic inches
8. Horsepower output (estimated) .60 brake horsepower
9. Operating RPM 6000 - 8000
10. Ball Bearing Mains
11. Full pressure lubrication
12. Oil supply - wet sump
13. Magneto Ignition
14. Regulation - load sensitive control through generator
15. Weight - 25 lbs. dry
16. Compression ratio - 7:1 to 9:1 as required
17. Number of moving parts - 9
18. Fabrication: Steel parts - crankshaft, piston pin, single sleeve valve, 2 gears, ball bearings, piston rings - cast iron. All other parts such as crank case, piston, cylinder head, manifolds (intake and exhaust) covers, etc., are aluminum alloy which can be sandcast, die cast or permanent mold.
19. Dimensions: overall height 13 inches; length - 11 inches; width - 11-1/2 inches incl. muffler

SPECIFICATIONS - GENERATOR

1. Modified inductor alternator
2. Voltage 115
3. Frequency 400 to 800 cycles - single phase
4. Power output 300 watts
5. Regulation - load sensitive
6. Weight - 6-1/4 lbs. Total electr. equipment 8-1/2 lbs.
7. Size - 5-1/2" diameter, 2-3/4" long
8. No slip rings, commutator or brushes

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